FIG. 1 (Prior Art)

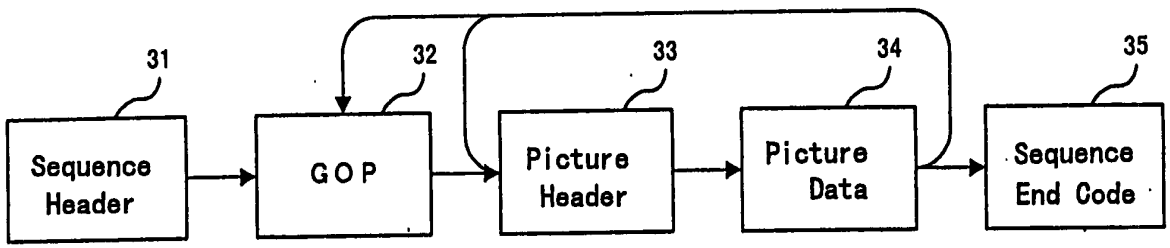

FIG. 2 (Prior Art)

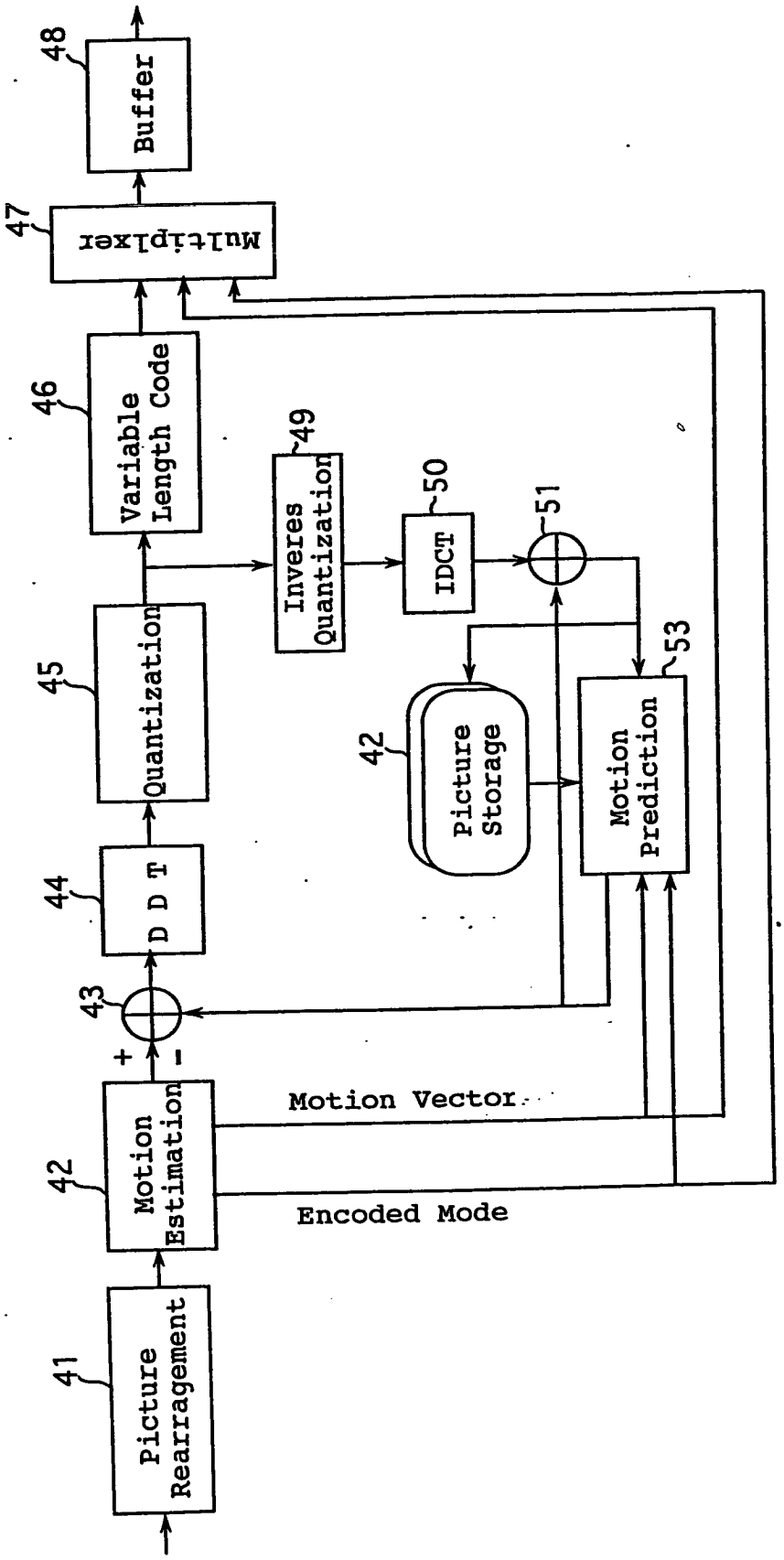

FIG. 3

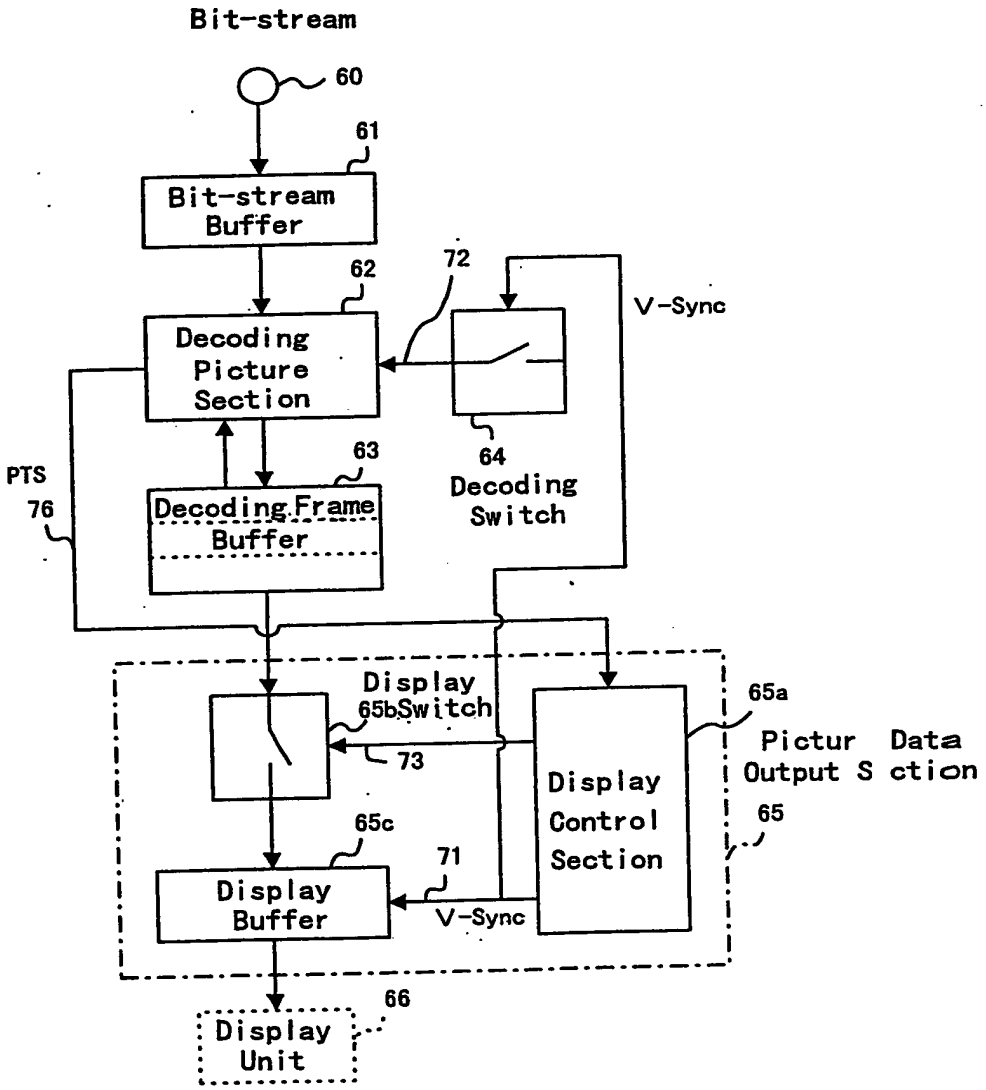
Bit-stream
60
61
Bit-stream Buffer
62
72
V-Sync
Decoding Picture Section
63
64
Decoding Switch
PTS
76
Decoding Frame Buffer
Display Switch
65b
73
65a
Pictur Data Output S ction
Display Control Section
65
65c
71
Display Buffer
V-Sync
66
Display Unit

FIG. 4

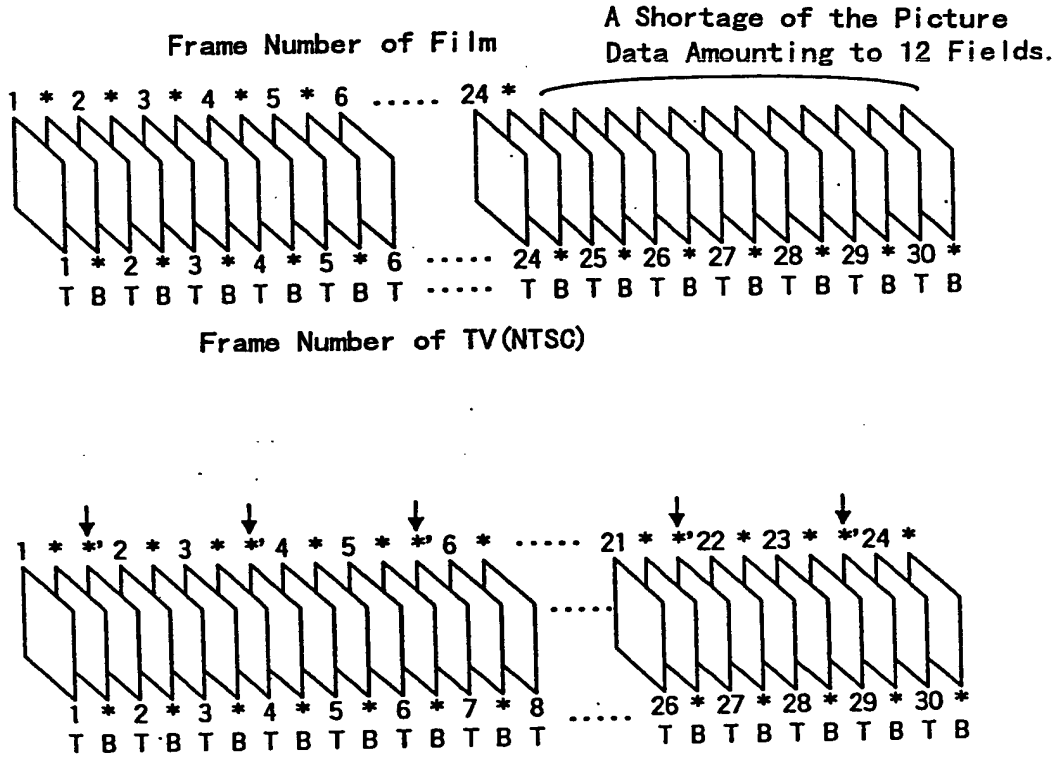
Frame Number of Film
A Shortage of the Picture Data Amounting to 12 Fields.
1 * 2 * 3 * 4 * 5 * 6 ..... 24 *
1 * 2 * 3 * 4 * 5 * 6 ..... 24 * 25 * 26 * 27 * 28 * 29 * 30 *
T B T B T B T B T B T ..... T B T B T B T B T B T B T B
Frame Number of TV(NTSC)
1 * *' 2 * 3 * *' 4 * 5 * *' 6 * ..... 21 * *' 22 * 23 * *' 24 *
1 * 2 * 3 * 4 * 5 * 6 * 7 * 8 ..... 26 * 27 * 28 * 29 * 30 *
T B T B T B T B T B T B T B T ..... T B T B T B T B T B T B

FIG. 5

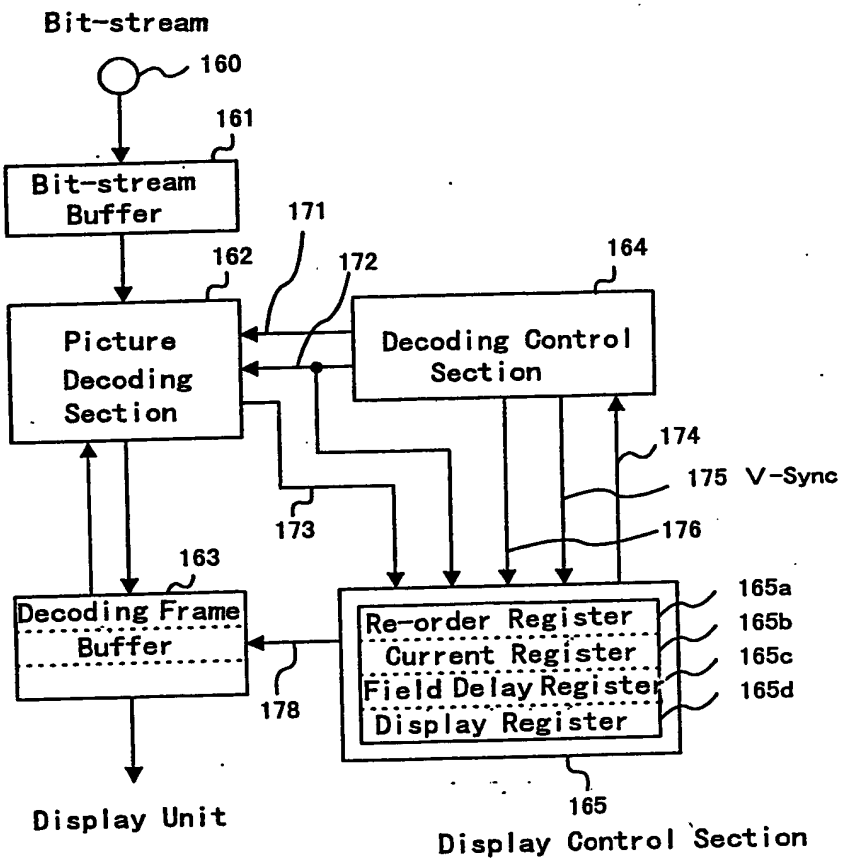
Bit-stream
160
161
Bit-stream Buffer
171
162
172
164
Picture Decoding Section
Decoding Control Section
174
175 V-Sync
173
176
163
Decoding Frame Buffer
165a
Re-order Register
165b
Current Register
165c
Field Delay Register
165d
Display Register
178
Display Unit
165
Display Control Section

FIG. 6

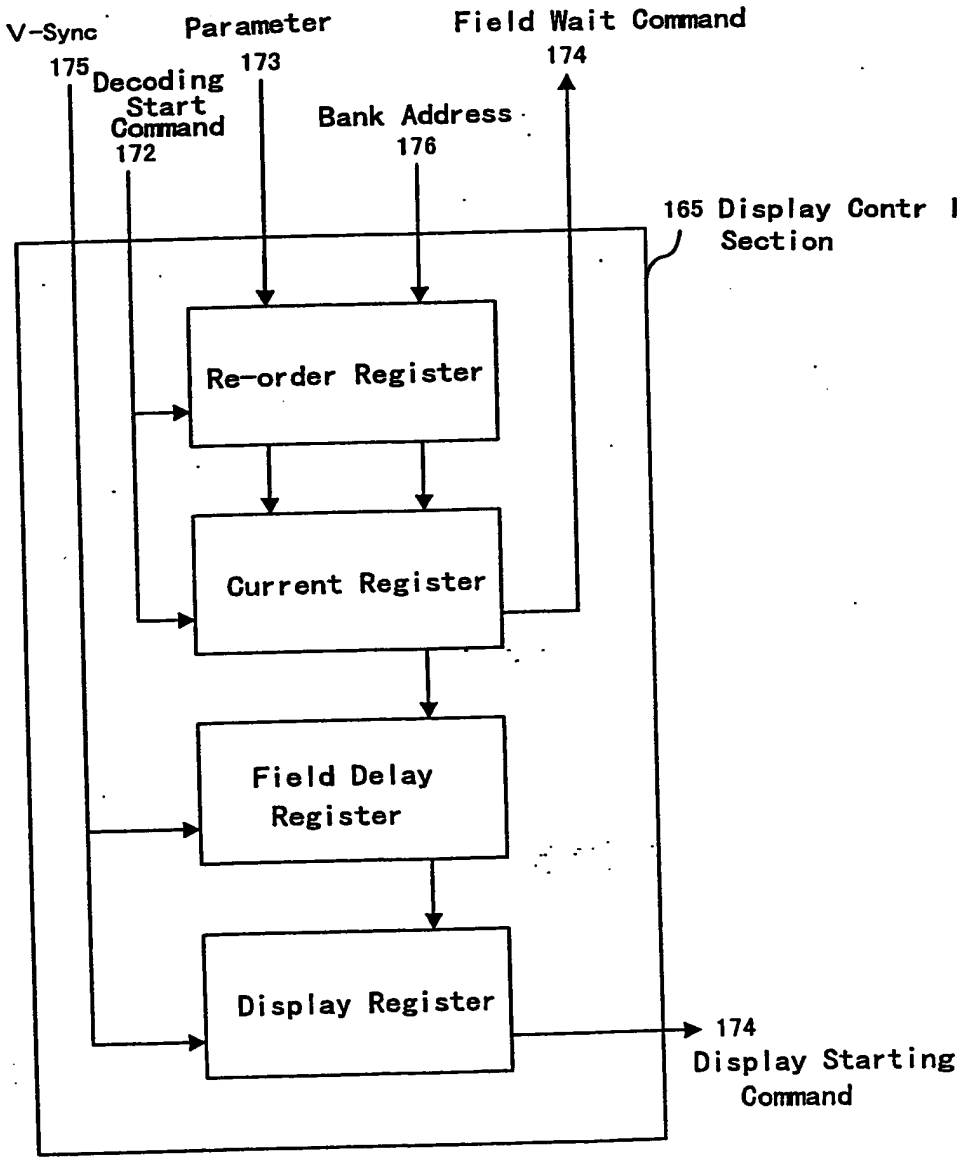
V-Sync
175
Parameter
173
Field Wait Command
174
Decoding Start Command
172
Bank Address
176
165 Display Contr l Section
Re-order Register
Current Register
Field Delay Register
Display Register
174
Display Starting Command

FIG. 7

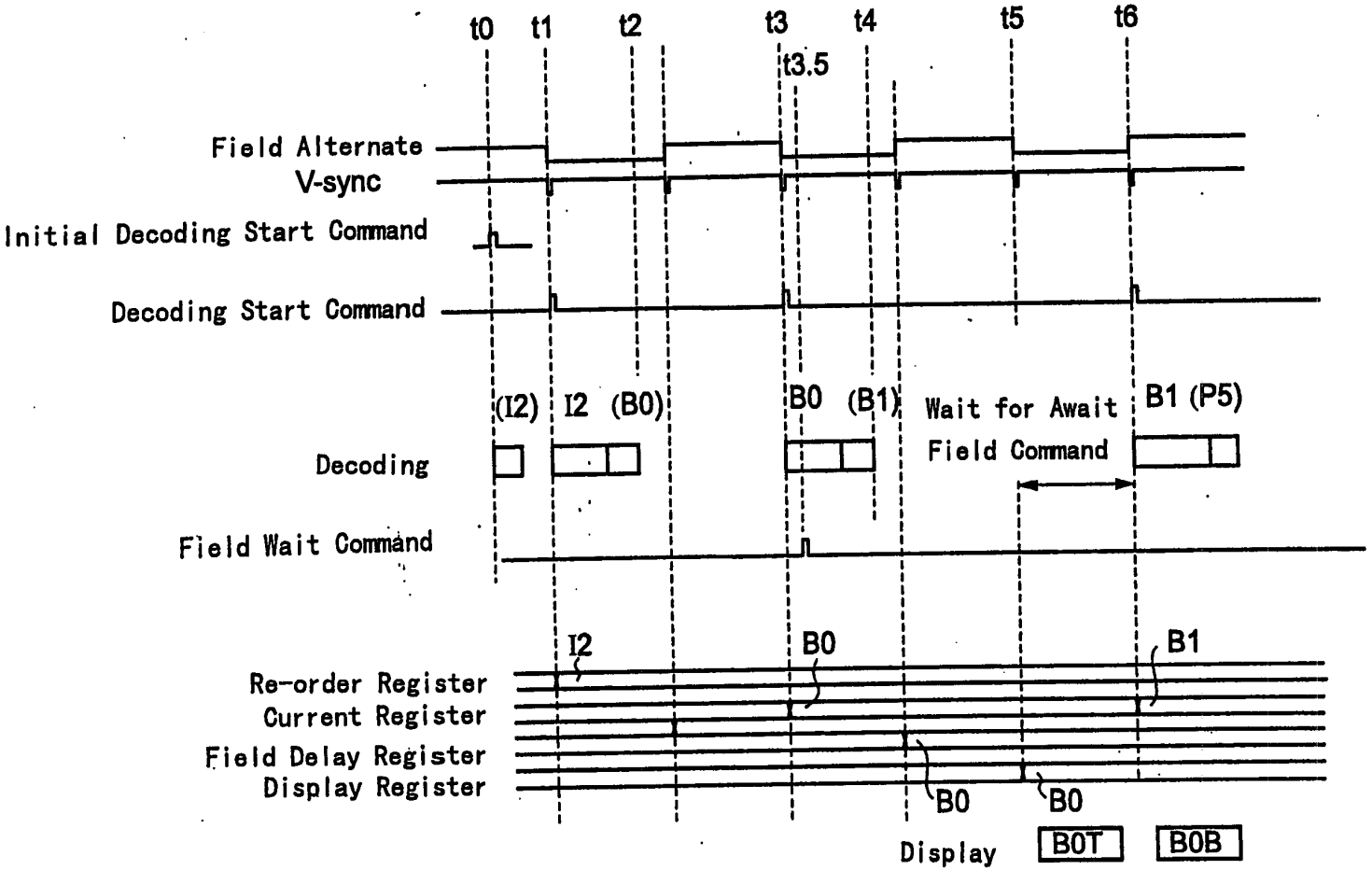
t0
t1
t2
t3
t4
t5
t6
t3.5
Field Alternate
V-sync
Initial Decoding Start Command
Decoding Start Command
(I2)
I2
(B0)
B0
(B1)
Wait for Await
Field Command
B1 (P5)
Decoding
Field Wait Command
I2
B0
B1
Re-order Register
Current Register
Field Delay Register
Display Register
B0
B0
Display
B0T
B0B

FIG. 8

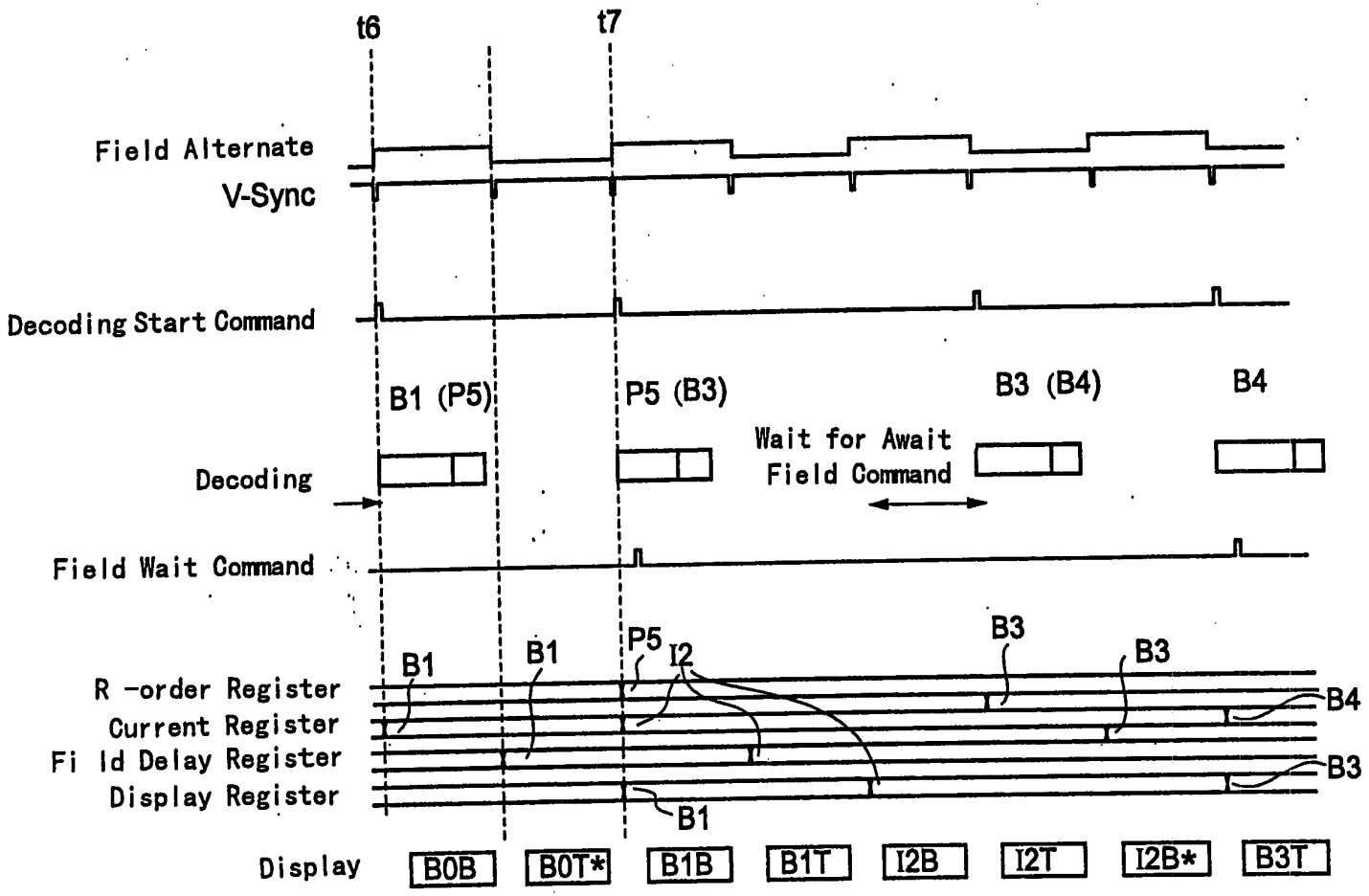
t6
t7
Field Alternate
V-Sync
Decoding Start Command
B1 (P5)
P5 (B3)
B3 (B4)
B4
Decoding
Wait for Await
Field Command
Field Wait Command
B1
B1
P5
I2
B3
B3
R -order Register
Current Register
Fi ld Delay Register
Display Register
B4
B3
B1
Display
B0B
B0T*
B1B
B1T
I2B
I2T
I2B*
B3T

FIG. 9

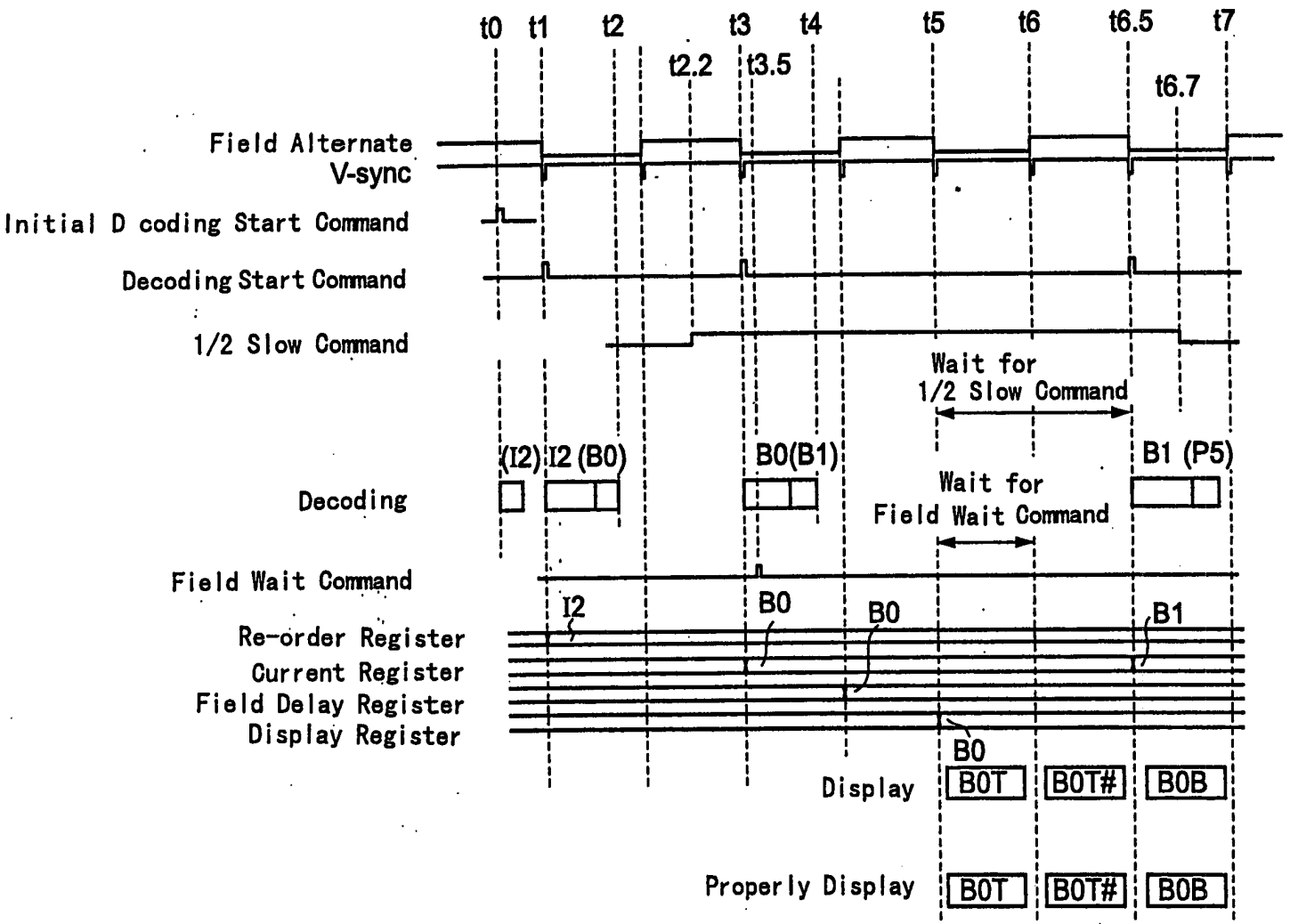
t0
t1
t2
t2.2
t3
t3.5
t4
t5
t6
t6.5
t6.7
t7
Field Alternate V-sync
Initial D coding Start Command
Decoding Start Command
1/2 Slow Command
Wait for 1/2 Slow Command
(I2)
I2 (B0)
B0(B1)
B1 (P5)
Decoding
Wait for Field Wait Command
Field Wait Command
I2
B0
B0
B1
Re-order Register
Current Register
Field Delay Register
Display Register
B0
Display
B0T
B0T#
B0B
Properly Display
B0T
B0T#
B0B

FIG. 10

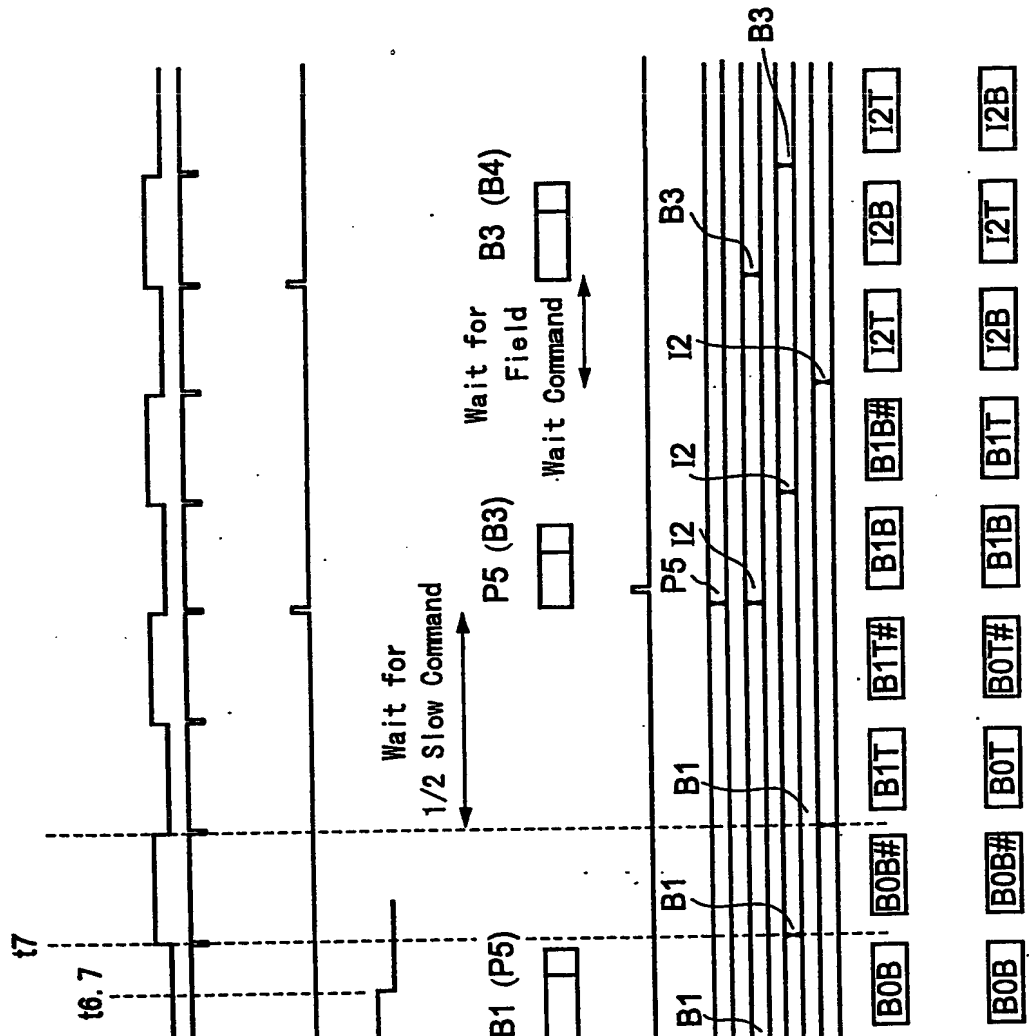
t7
t6.7
Field Alternate V-sync
Decoding Start Command
1/2 Slow Command
Wait for 1/2 Slow Command
B1 (P5)
P5 (B3)
Wait for Field Wait Command
B3 (B4)
Decoding
Fi ld Wait Command
Re-order Register
Current Register
Fi ld Delay Register
Display Register
B1
P5
I2
B3
B0B
B0B#
B1T
B1T#
B1B
B1B#
I2T
I2B
B0T
B0T#

FIG. 11

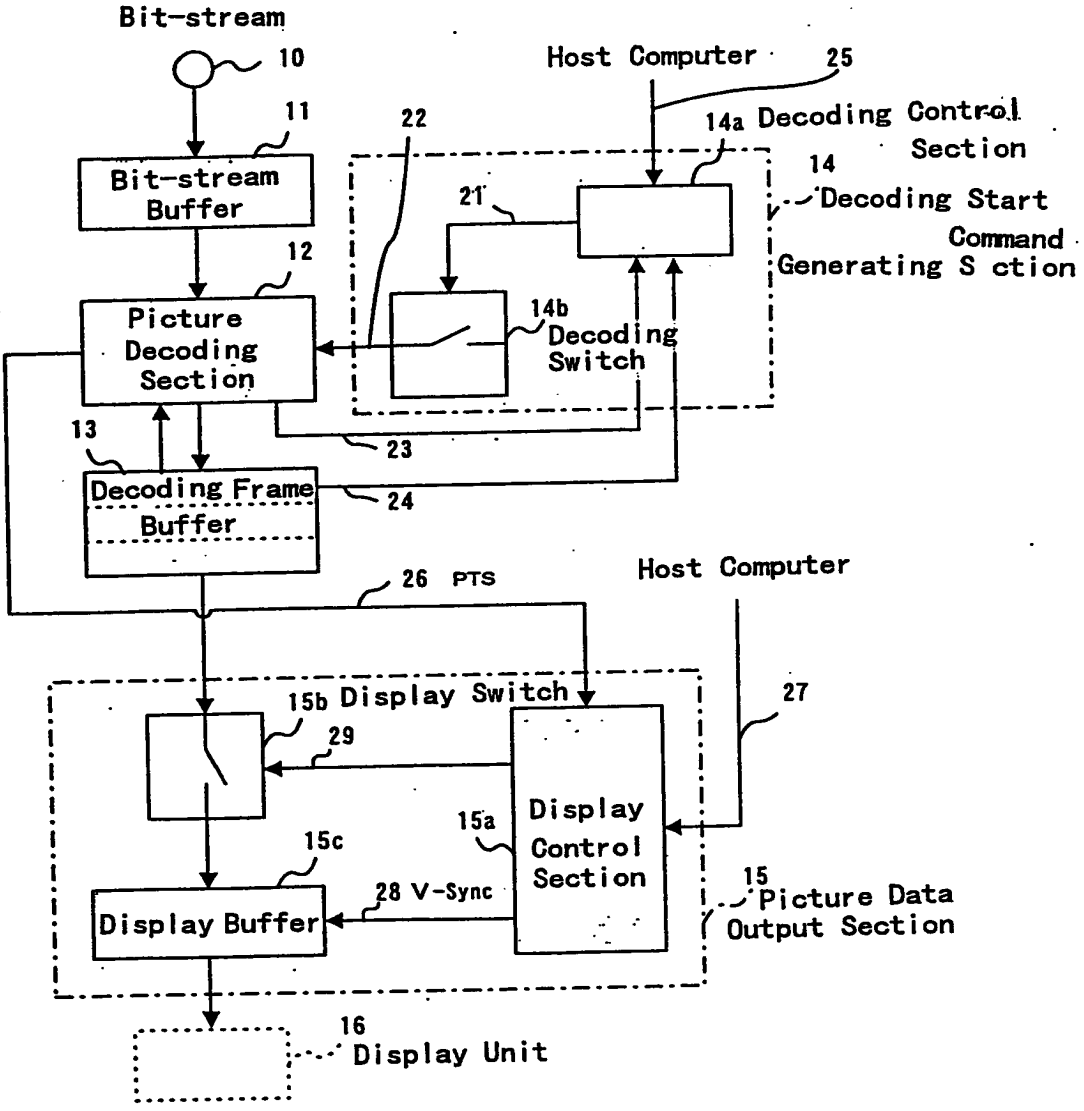
Bit-stream
10
Host Computer
25
11
22
14a Decoding Control Section
14
Decoding Start Command Generating S ction
Bit-stream Buffer
21
12
Picture Decoding Section
14b Decoding Switch
13
23
Decoding Frame Buffer
24
26 PTS
Host Computer
15b Display Switch
27
29
Display Control Section
15a
15c
28 V-Sync
15 Picture Data Output Section
Display Buffer
16
Display Unit

FIG. 12

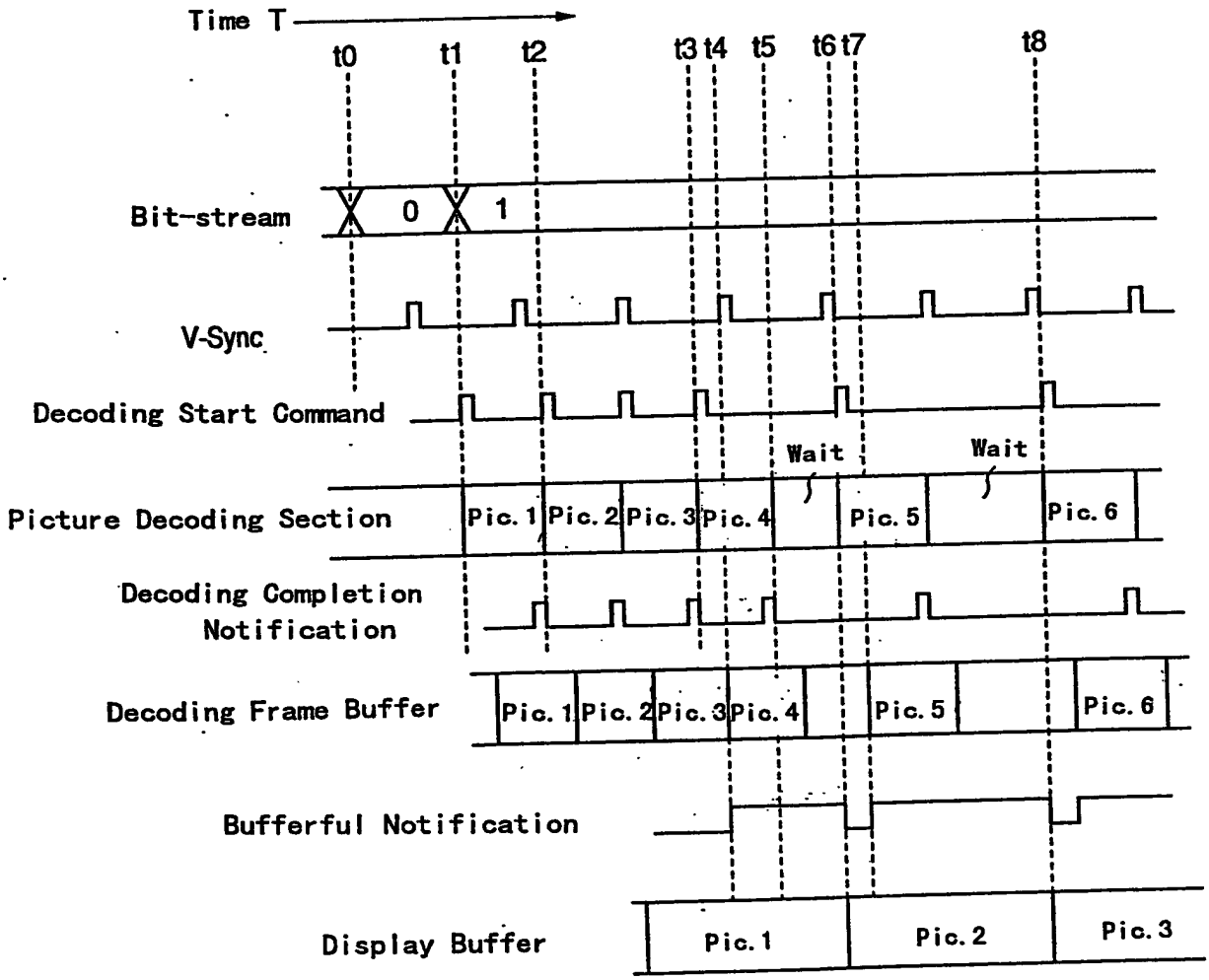
Time T
t0
t1
t2
t3
t4
t5
t6
t7
t8
Bit-stream
0
1
V-Sync
Decoding Start Command
Wait
Wait
Picture Decoding Section
Pic. 1
Pic. 2
Pic. 3
Pic. 4
Pic. 5
Pic. 6
Decoding Completion Notification
Decoding Frame Buffer
Pic. 1
Pic. 2
Pic. 3
Pic. 4
Pic. 5
Pic. 6
Bufferful Notification
Display Buffer
Pic. 1
Pic. 2
Pic. 3

FIG. 13

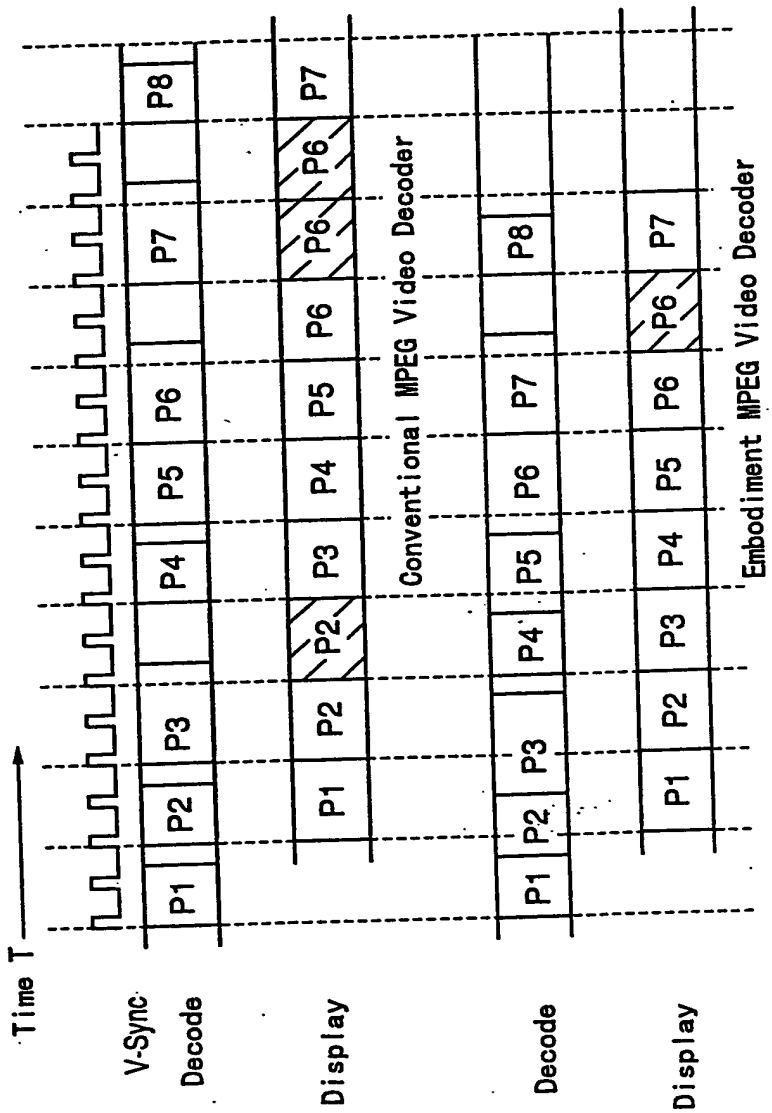
Time T
V-Sync
Decode
Display
Conventional MPEG Video Decoder
Decode
Display
Embodiment MPEG Video Decoder
P1
P2
P3
P4
P5
P6
P7
P8

FIG. 14

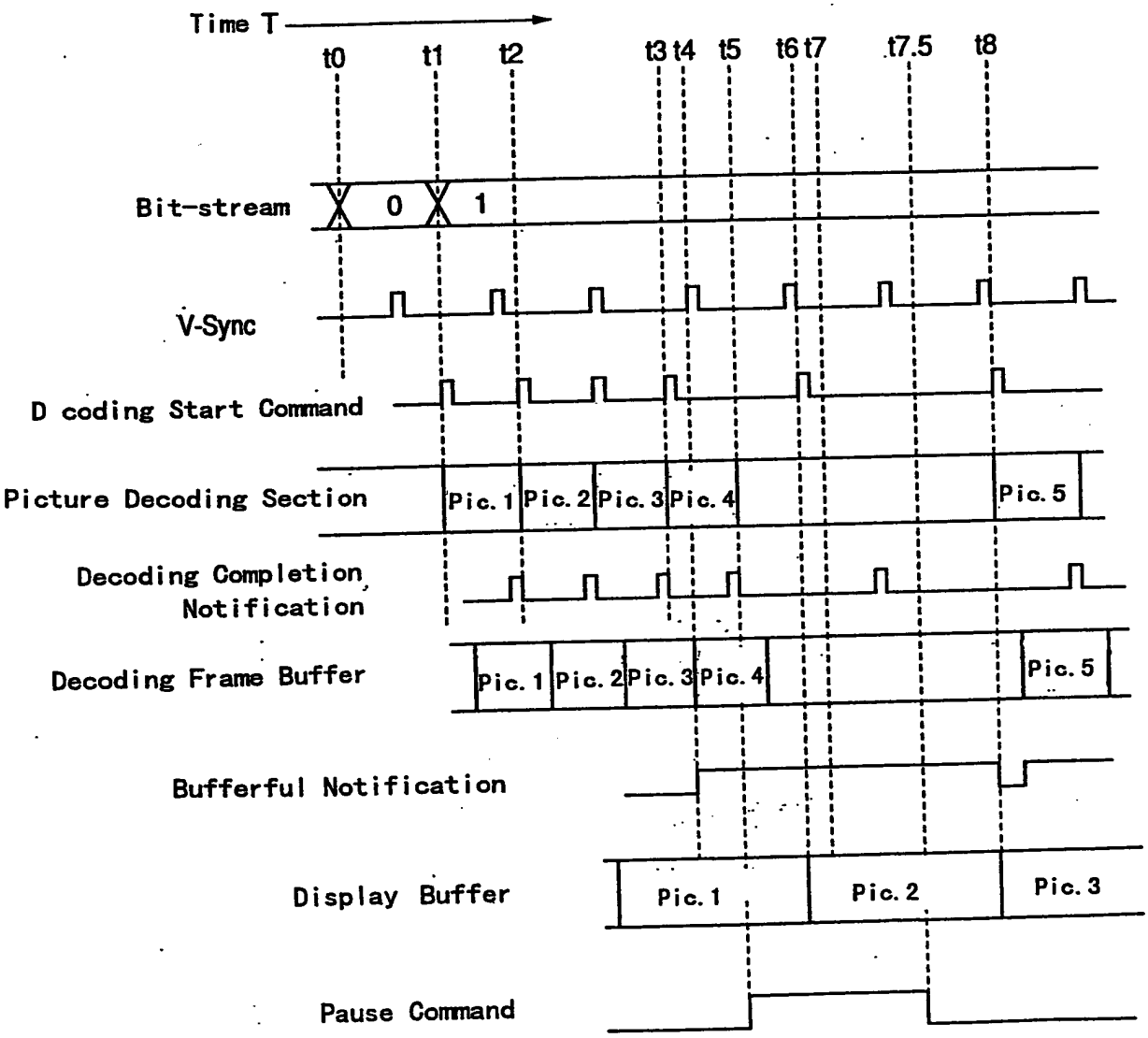
Time T
t0
t1
t2
t3
t4
t5
t6
t7
t7.5
t8
Bit-stream
0
1
V-Sync
D coding Start Command
Picture Decoding Section
Pic. 1
Pic. 2
Pic. 3
Pic. 4
Pic. 5
Decoding Completion Notification
Decoding Frame Buffer
Pic. 1
Pic. 2
Pic. 3
Pic. 4
Pic. 5
Bufferful Notification
Display Buffer
Pic. 1
Pic. 2
Pic. 3
Pause Command

FIG. 15

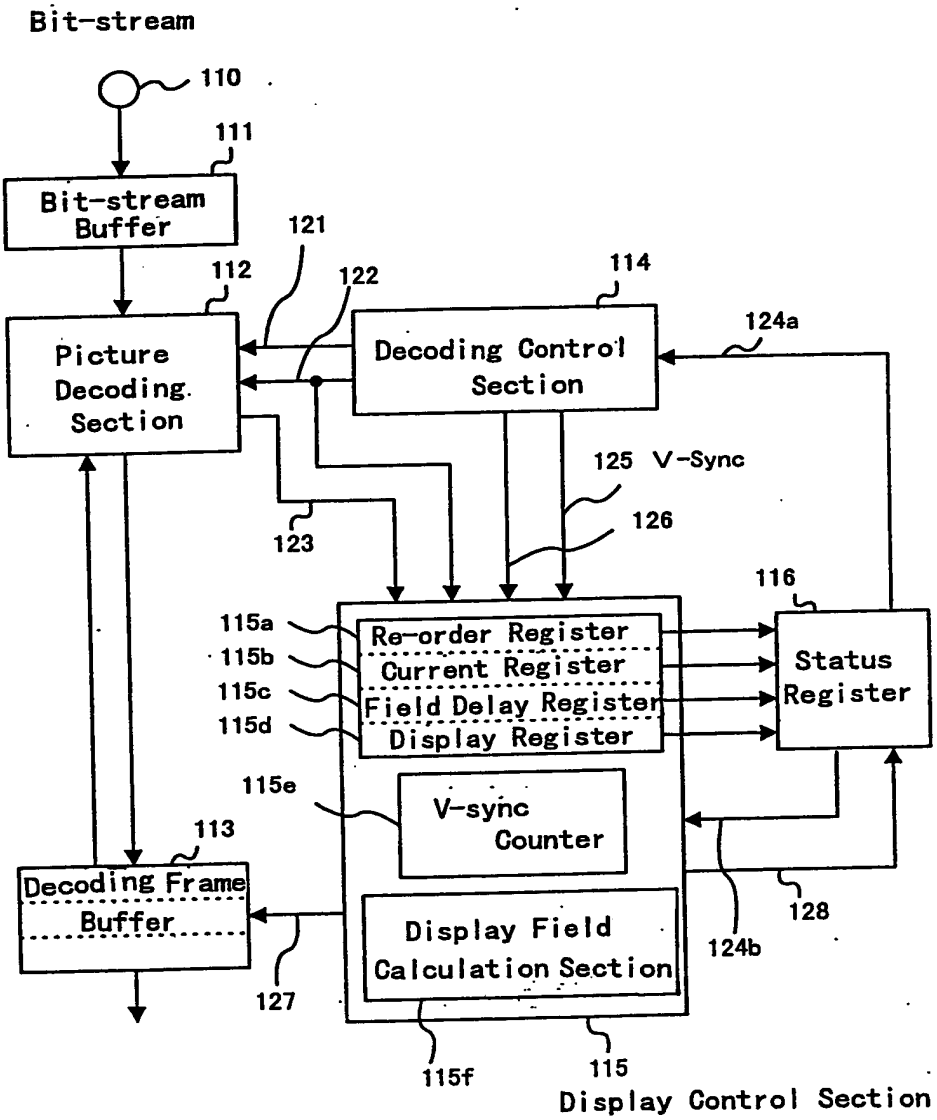
Bit-stream
110
111
Bit-stream Buffer
121
122
112
114
Picture Decoding Section
Decoding Control Section
124a
125 V-Sync
126
123
116
115a
115b
115c
115d
Re-order Register
Current Register
Field Delay Register
Display Register
Status Register
115e
V-sync Counter
113
Decoding Frame Buffer
Display Field Calculation Section
128
124b
127
115f
115
Display Control Section

FIG. 16

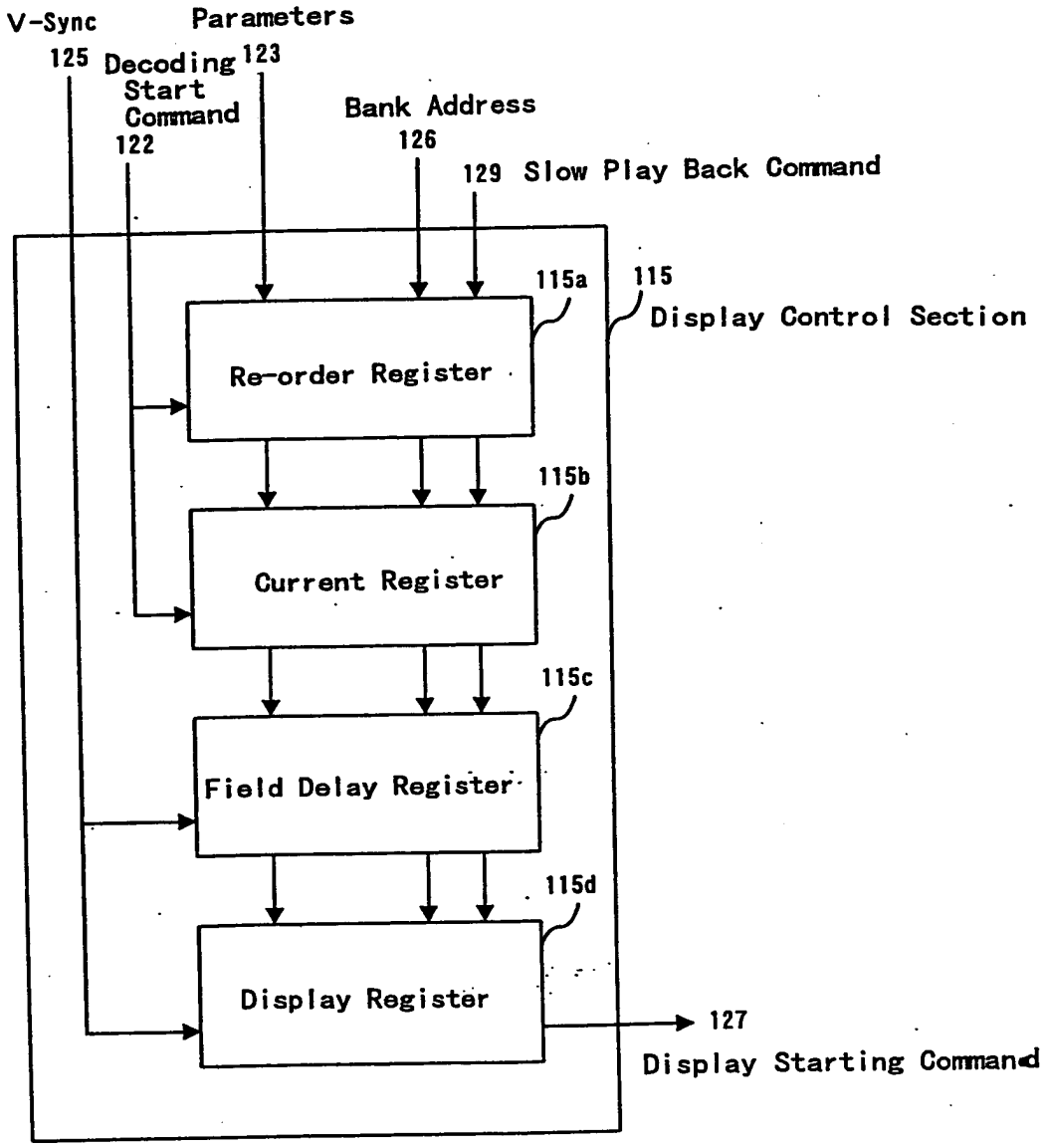
V-Sync
125
Parameters
123
Decoding Start Command
122
Bank Address
126
129 Slow Play Back Command
115a
115
Display Control Section
Re-order Register
115b
Current Register
115c
Field Delay Register
115d
Display Register
127
Display Starting Command

FIG. 17

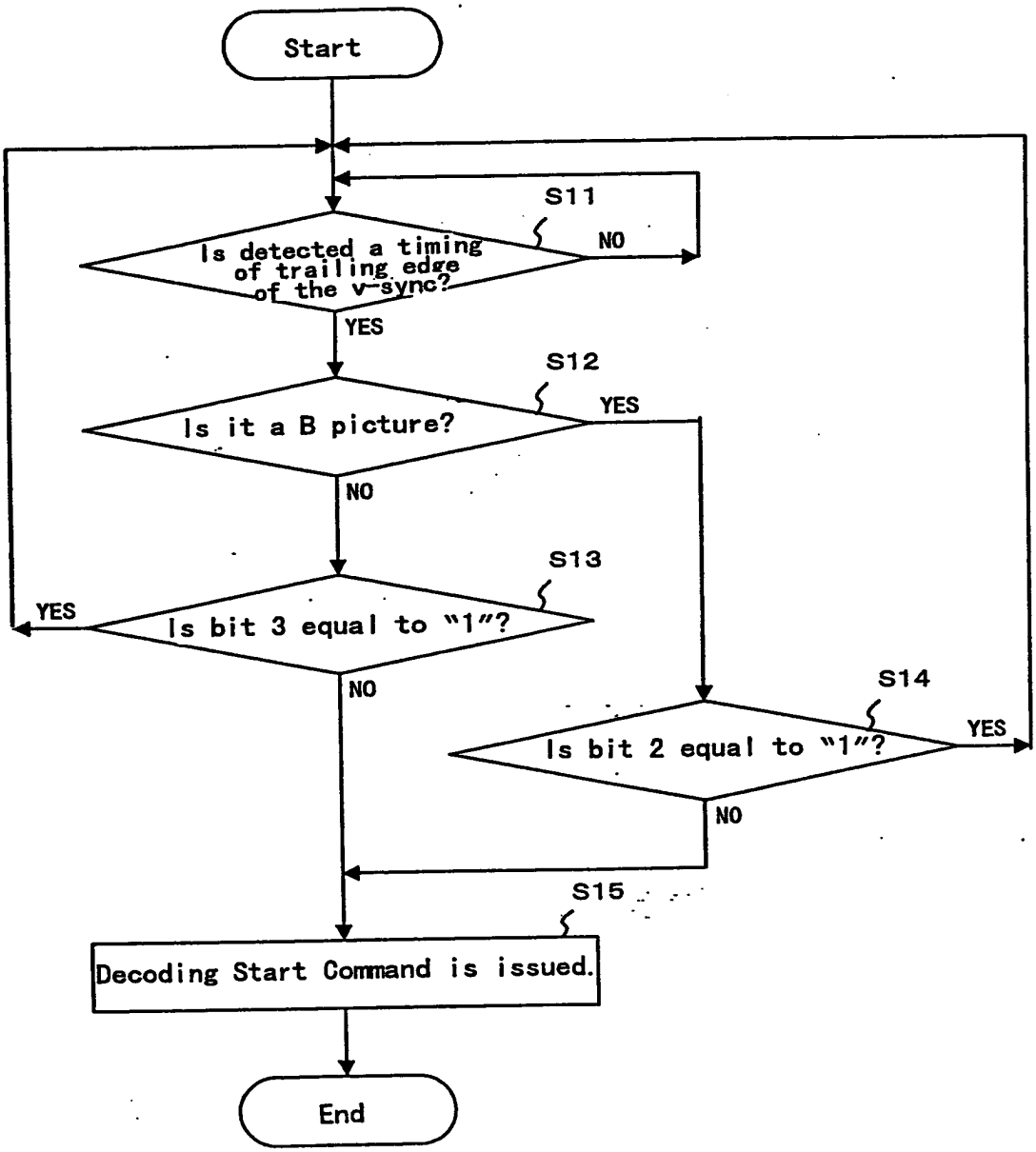
Start
S11
Is detected a timing of trailing edge of the v-sync?
NO
YES
S12
Is it a B picture?
YES
NO
S13
Is bit 3 equal to "1"?
YES
NO
S14
Is bit 2 equal to "1"?
YES
NO
S15
Decoding Start Command is issued.
End

FIG. 18

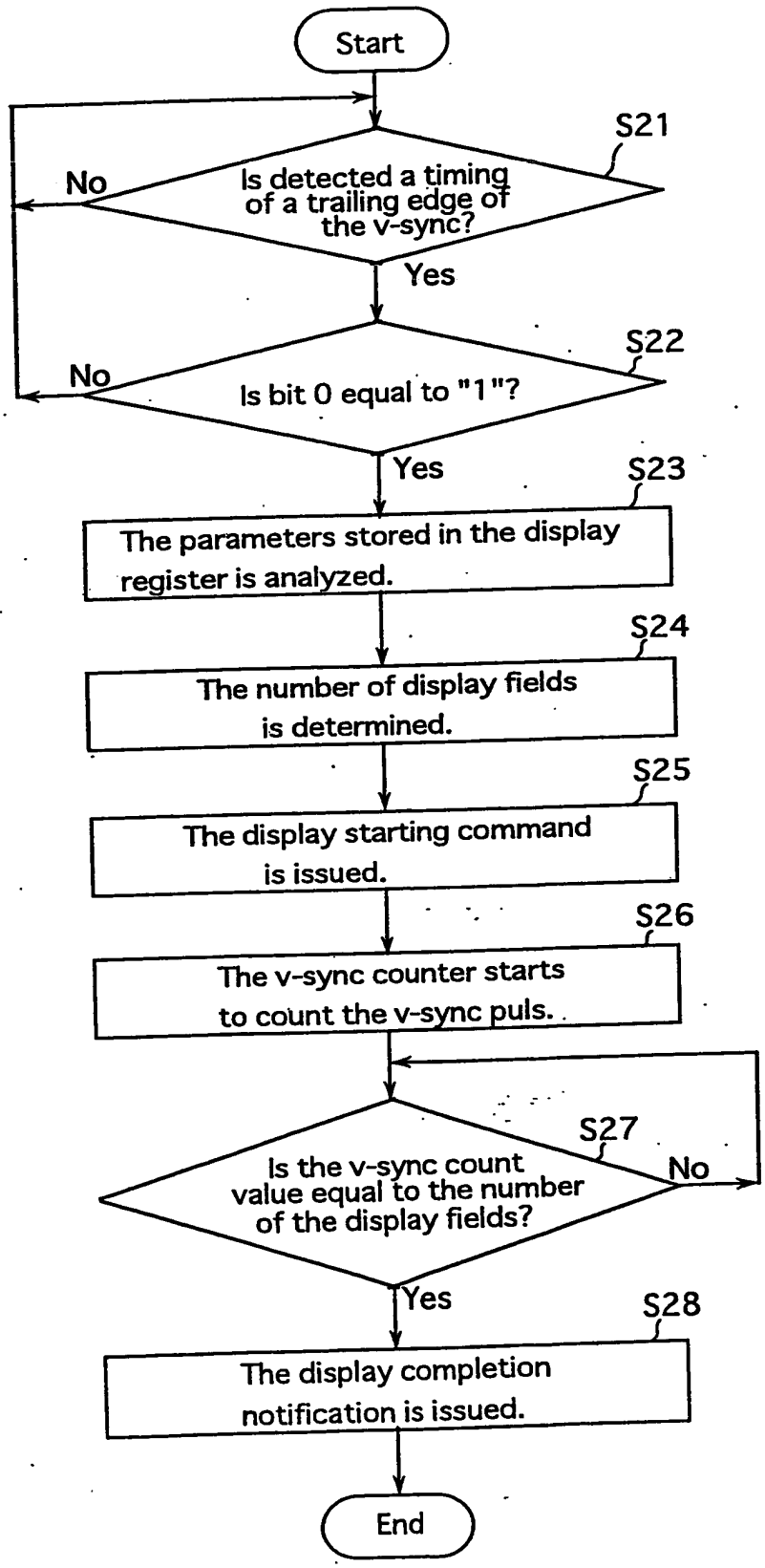
Start
S21
Is detected a timing of a trailing edge of the v-sync?
No
Yes
S22
Is bit 0 equal to "1"?
No
Yes
S23
The parameters stored in the display register is analyzed.
S24
The number of display fields is determined.
S25
The display starting command is issued.
S26
The v-sync counter starts to count the v-sync puls.
S27
Is the v-sync count value equal to the number of the display fields?
No
Yes
S28
The display completion notification is issued.
End

FIG. 19

Parameters		Number of the Display Fields
Repeat First Field Flag	1/2 Slow Play Back Command Flag	
0	0	2
0	1	4
1	0	3
1	1	6

FIG. 20

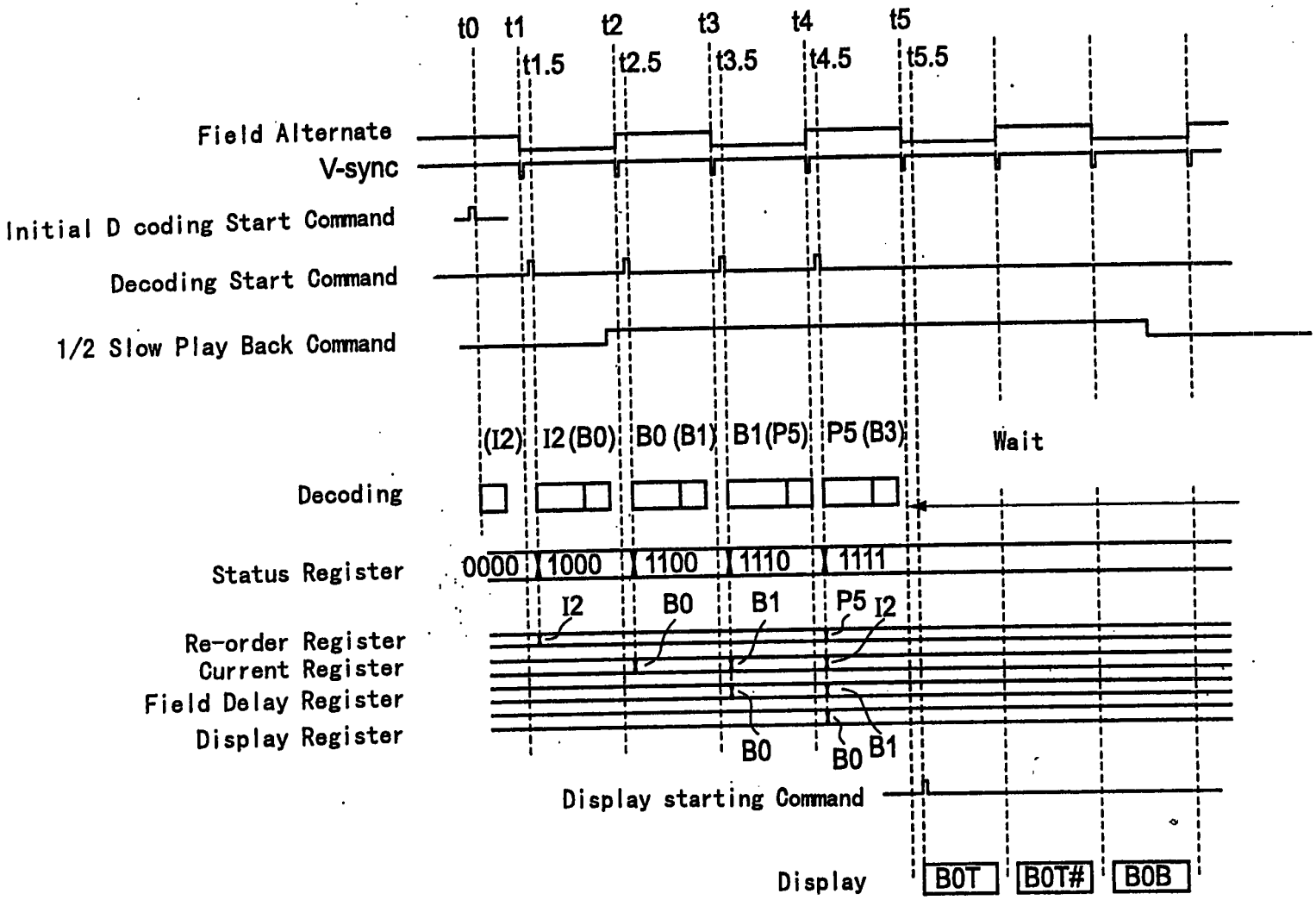
t0
t1
t2
t3
t4
t5
t1.5
t2.5
t3.5
t4.5
t5.5
Field Alternate
V-sync
Initial D coding Start Command
Decoding Start Command
1/2 Slow Play Back Command
(I2)
I2 (B0)
B0 (B1)
B1 (P5)
P5 (B3)
Wait
Decoding
Status Register
0000
1000
1100
1110
1111
Re-order Register
Current Register
Field Delay Register
Display Register
I2
B0
B1
P5
I2
B0
B0
B1
Display starting Command
Display
B0T
B0T#
B0B

FIG. 21

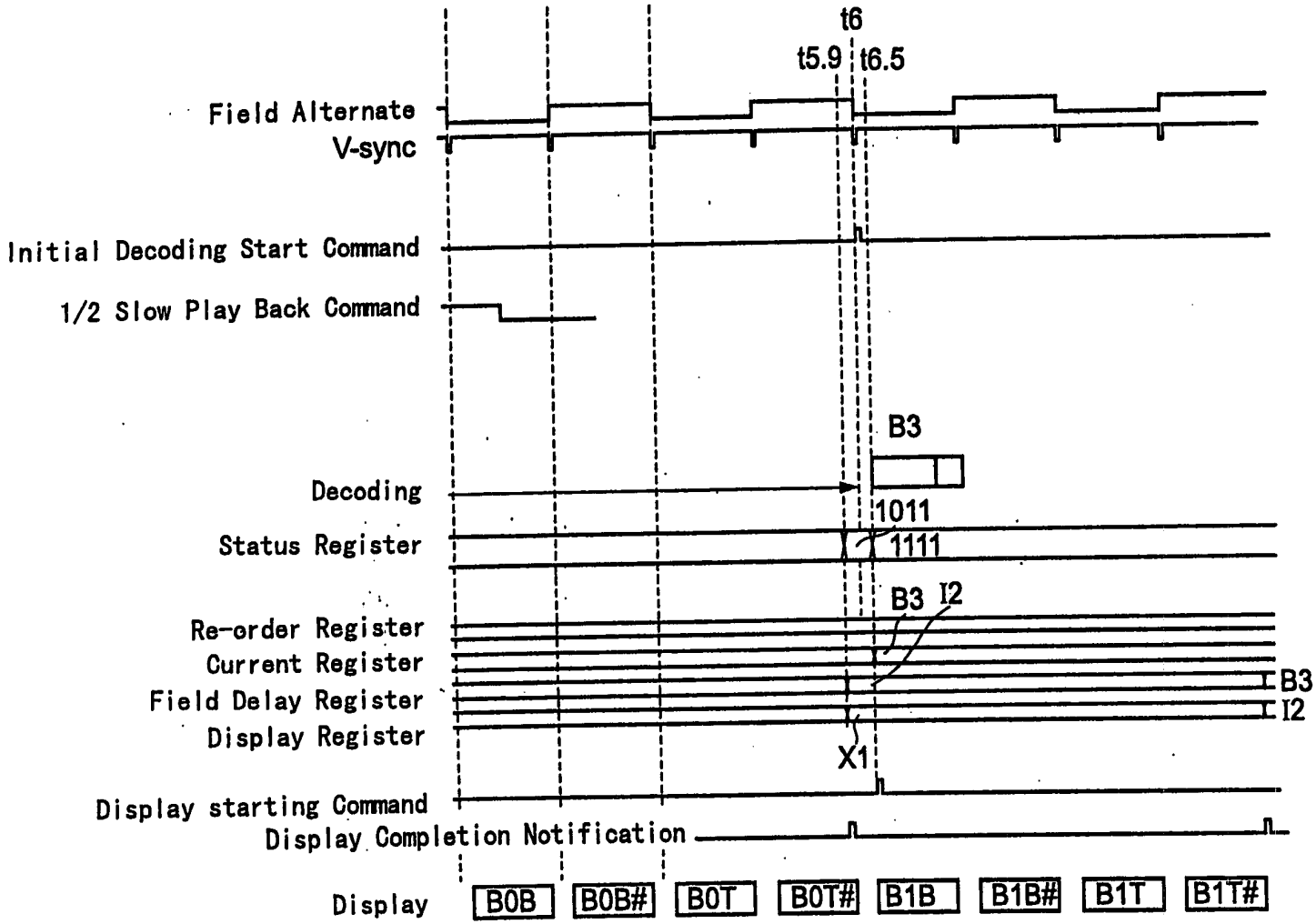
t6
t5.9
t6.5
Field Alternate
V-sync
Initial Decoding Start Command
1/2 Slow Play Back Command
B3
Decoding
1011
Status Register
1111
B3
I2
Re-order Register
Current Register
Field Delay Register
Display Register
B3
I2
X1
Display starting Command
Display Completion Notification
Display
B0B
B0B#
B0T
B0T#
B1B
B1B#
B1T
B1T#

FIG. 22

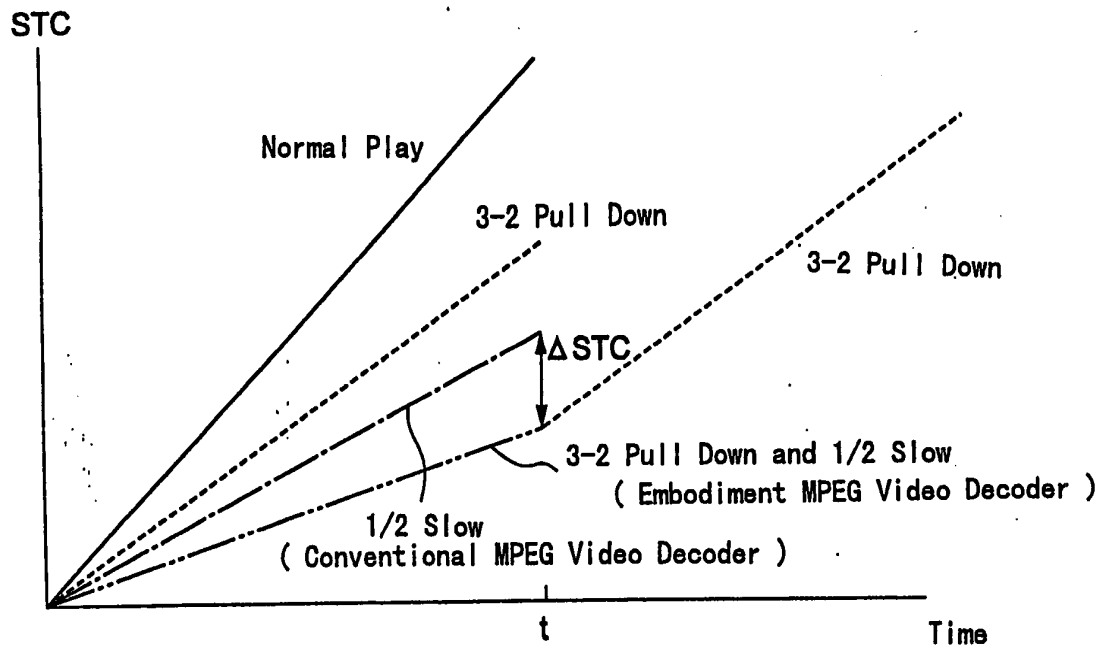
STC
Normal Play
3-2 Pull Down
3-2 Pull Down
ΔSTC
3-2 Pull Down and 1/2 Slow
(Embodiment MPEG Video Decoder)
1/2 Slow
(Conventional MPEG Video Decoder)
t
Time

FIG. 23

Parameters					Number of the Display Fields
Repeat First Field Flag	Slow Play Back Flag				
	1／2	1／3	1／4	1／8	
0	0	0	0	0	2
0	1	0	0	0	4
0	0	1	0	0	6
0	0	0	1	0	8
0	0	0	0	1	16
1	0	0	0	0	3
1	1	0	0	0	6
1	0	1	0	0	9
1	0	0	1	0	12
1	0	0	0	1	24